



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/881,670	06/18/2001	Ryuichi Matsuda	209667US-2	7193

22850 7590 01/10/2005

OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER

ALEJANDRO MULERO, LUZ L

ART UNIT	PAPER NUMBER
----------	--------------

1763

DATE MAILED: 01/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/881,670

Applicant(s)

MATSUDA ET AL.

Examiner

Luz L. Alejandro

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 November 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 3, 4 and 11 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 3-4, 11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/19/04 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 3-4 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al., U.S. Patent 6,288,493 in view of Holland et al., U.S. Patent 5,800,619 and Kazumi et al., U.S. Patent 6,180,019 or Tobin et al., U.S. Patent 5,619,103.

Lee et al. shows the invention as claimed including a semiconductor manufacturing apparatus 10 comprising: a vessel 104 having an electromagnetic wave transparent window; a power supply antenna 100/100' provided outside the vessel and opposed to the electromagnetic wave transparent window; and a power source 102/102' for applying a high frequency voltage to the power supply antenna; and being adapted to apply the high frequency voltage from the power source to the power supply antenna to generate an electromagnetic wave, and pass the electromagnetic wave through the electromagnetic wave transparent window into the vessel to generate a plasma, thereby treating a surface of a substrate 106 in the vessel 104, wherein the power supply antenna comprises a plurality of coils 310a, 310b, 310c disposed concentrically, the plurality of coils comprising a plurality of conductors bent into a form of an arc, and power supply portions formed at opposite ends of the respective coils so as to be common plane (see figs. 1 and 3B, col. 1-line 43 to col. 2-line 2 and col. 3-line 34 to col. 4-line 67).

Lee et al. does not expressly disclose that at least one of the coils is disposed on a plane parallel to the common plane. Holland et al. suggests positioning coils in many different planes above a dielectric window (see col. 14-lines 10-23). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Lee et al. so as to produce a coil

Art Unit: 1763

structure as suggested by Holland et al. because this produces an apparatus with a plasma having a relatively uniform density (see col. 13-lines 46-51).

Lee et al. and Holland et al. do not expressly disclose the coils have adjustable radii (adjustable positions, see page 27, lines 12-16 of the specification of the instant claimed invention). Kazumi et al. discloses an apparatus comprising coils having adjustable radii in order to vary the degree and position of the coupling of the plasma, and to control the density of the plasma (see for example, figs. 16, 23a, 23b, and their descriptions, especially col. 11-line 45 to col. 12-line 6). Additionally, Tobin et al. discloses an apparatus comprising coils having adjustable radii in order to vary the plasma field and plasma profile (see, for example, figs. 11e and 11 f, and col. 8, lines 35-57). Therefore, in view of these disclosures, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Lee et al. modified by Holland et al. as to comprise coils having adjustable radii in order to to vary the degree and position of the coupling of the plasma, and to control the density of the plasma.

Lee et al., Holland et al., Kazumi et al. and Tobin et al. are applied as above but do not expressly disclose where spacing between the adjacent power supply portions in the respective coils is equal. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine through routine experimentation the optimum spacing between the power supply portions in adjacent coils based upon a variety of factors, including reducing potential problems such as cross over of wires connecting different coils to the power supply that can lead to

shorting, and such limitation would not lend patentability to the instant application absent the showing of unexpected results.

Claims 3-4 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al., U.S. Patent 6,288,493 in view of Hemker et al., U.S. 2004/0011467 and Kazumi et al., U.S. Patent 6,180,019 or Tobin et al., U.S. Patent 5,619,103.

Lee et al. shows the invention as claimed including a semiconductor manufacturing apparatus 10 comprising: a vessel 104 having an electromagnetic wave transparent window; a power supply antenna 100/100' provided outside the vessel and opposed to the electromagnetic wave transparent window; and a power source 102/102' for applying a high frequency voltage to the power supply antenna; and being adapted to apply the high frequency voltage from the power source to the power supply antenna to generate an electromagnetic wave, and pass the electromagnetic wave through the electromagnetic wave transparent window into the vessel to generate a plasma, thereby treating a surface of a substrate 106 in the vessel 104, wherein the power supply antenna comprises a plurality of coils 310a, 310b, 310c disposed concentrically, the plurality of coils comprising a plurality of conductors bent into a form of an arc, and power supply portions formed at opposite ends of the respective coils so as to be common plane (see figs. 1 and 3B, col. 1-line 43 to col. 2-line 2 and col. 3-line 34 to col. 4-line 67).

Lee et al. does not expressly disclose that at least one of the coils is disposed on a plane parallel to the common plane. Hemker et al. discloses stacking coils in planes

Art Unit: 1763

parallel to each other in order to promote symmetric coupling (see, for example, paragraph 0058 and fig. 1). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Lee et al. so as to arrange the coils in a stack configuration as suggested by Hemker et al. in order to promote symmetric coupling for creating a high level of processing uniformity.

Lee et al. and Hemker et al. do not expressly disclose the coils have adjustable radii (adjustable positions, see page 27, lines 12-16 of the specification of the instant claimed invention). Kazumi et al. discloses an apparatus comprising coils having adjustable radii in order to vary the degree and position of the coupling of the plasma, and to control the density of the plasma (see for example, figs. 16, 23a, 23b, and their descriptions, especially col. 11-line 45 to col. 12-line 6). Additionally, Tobin et al. discloses an apparatus comprising coils having adjustable radii in order to vary the plasma field and plasma profile (see, for example, figs. 11e and 11 f, and col. 8, lines 35-57). Therefore, in view of these disclosures, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Lee et al. modified by Hemker et al. as to comprise coils having adjustable radii in order to to vary the degree and position of the coupling of the plasma, and to control the density of the plasma.

Lee et al., Hemker et al., Kazumi et al. and Tobin et al. do not expressly disclose where spacing between the adjacent power supply portions in the respective coils is equal. However, it would have been obvious to one of ordinary skill in the art at the time

Art Unit: 1763

the invention was made to determine through routine experimentation the optimum spacing between the power supply portions in adjacent coils based upon a variety of factors, including reducing potential problems such as cross over of wires connecting different coils to the power supply that can lead to shorting, and such limitation would not lend patentability to the instant application absent the showing of unexpected results.

Response to Arguments

Applicant's arguments filed 11/17/04 have been fully considered, and some are moot in view of the new ground(s) of rejection, and the other arguments are not persuasive as described below.

Applicant argues that Holland does not disclose or suggest that at least one of the coils is disposed on a plane parallel to the common plane. The examiner respectfully disagrees because the Holland et al. reference discloses that the coils can be disposed in many different planes (see col. 14, lines 10-12).

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., that the vertical distance L between the coils is predetermined to vary mutual inductances so that the distribution of energy absorbed to the plasma is adjusted and adjusting the distance between the coils in order to vary mutual inductances) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Art Unit: 1763

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luz L. Alejandro whose telephone number is 571-272-1430. The examiner can normally be reached on Monday to Thursday from 7:30 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory L. Mills can be reached on 571-272-1439. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Luz L. Alejandro
Primary Examiner
Art Unit 1763

January 6, 2005